We Claim:

1. A hydrogen storage bed system including:

a pressure container;

a hydrogen storage alloy disposed within said pressure container; and

an integrated thermal management system integrally disposed within said pressure container including:

heat generation means;

cooling means; and

heat distribution means.

2. The hydrogen storage bed system of claim 1, wherein said heat generation means is selected from the group consisting of electrical heating elements and catalytic combustors.

3. The hydrogen storage bed system of claim 2, wherein said heat generation means is one or more catalytic combustors.

4. The hydrogen storage bed system of claim 3, wherein said catalytic combustors are designed to combust at least one fuel selected from the group consisting of hydrogen, gasoline, fuel oil, propane, diesel fuel, and natural gas.

5. The hydrogen storage bed system of claim 4, wherein said catalytic combustors are designed to combust propane.

6. The hydrogen storage bed system of claim 1, wherein said cooling means comprises a tube-type heat exchanger.

7. The hydrogen storage bed system of claim 6, wherein said tube-type heat exchanger is designed to utilize at least one coolant selected from the group consisting of air, hydrogen, water and organic coolants.

8. The hydrogen storage bed system of claim 7, wherein said tube-type heat exchanger is designed to utilize air as the coolant.

9. The hydrogen storage bed system of claim 7, wherein said tube-type heat exchanger is designed to utilize hydrogen as the coolant.

10. The hydrogen storage bed system of claim 7, wherein said tube-type heat exchanger is designed to utilize water as the coolant.

11. The hydrogen storage bed system of claim 1, wherein said heat generation means and said cooling means are combined into a single unit designed to catalytically combust propane or hydrogen and utilize air or hydrogen as the coolant.

12. The hydrogen storage bed system of claim 1, wherein said heat distribution means includes heat sinks thermally coupled to both said heat generation means and said cooling means.

13. The hydrogen storage bed system of claim 12, wherein said heat distribution means further includes heat distribution fins thermally coupled to said heat sinks and dispersed within said hydrogen storage alloy.

14. The hydrogen storage bed system of claim 13, wherein said heat distribution fins and said heat sinks are formed from a material selected from the group consisting of thermally conductive graphite, stainless steel, magnesium and magnesium alloys.

15. The hydrogen storage bed system of claim 1, wherein said heat distribution means includes heat pipes thermally coupled to both said heat generation means and said cooling means.

16. The hydrogen storage bed system of claim 15, wherein said heat distribution means further includes heat distribution fins thermally coupled to said heat pipes and dispersed within said hydrogen storage alloy.

17. The hydrogen storage bed system of claim 16, wherein said heat distribution fins are formed from a material selected rrom the group consisting of thermally conductive graphite, stainless steel, magnesium and magnesium alloys.

18. The hydrogen storage bed system of claim 1, wherein said hydrogen storage alloy is selected from the group consisting of T-Zr based alloys and Mg based alloys.

19. The hydrogen storage bed system of claim 18, wherein said hydrogen storage alloy is a Mg based alloy.

20. The hydrogen storage bed system of claim 19, wherein said alloy includes at least 90 weight % magnesium.

21. The hydrogen storage bed system of claim 20, wherein said alloy further includes 0.5-2.5 weight % nickel.

22. The hydrogen storage bed system of claim 21, wherein said alloy further includes 1.0-4.0 weight % Misch metal.

23. The hydrogen storage bed system of claim 22, wherein said alloy further includes 1.0-4.0 weight % Misch metal.

24. The hydrogen storage bed system of claim 23, wherein said Misch metal comprises predominantly Ce, La and Pr.

25. The hydrogen storage bed system of claim 23, wherein said alloy further includes one or more from the group consisting of 3-7 weight % Al, 0.1-1.5 weight % Y and 0.3-1.5 weight % silicon.

26. The hydrogen storage bed system of claim 19, wherein said hydrogen storage alloy is in the form of powder, pellets or a mixture thereof.

27. The hydrogen storage bed system of claim 26, wherein said hydrogen storage alloy is in the form of a mixture of powder and pellets.

28. The hydrogen storage bed system of claim 1, wherein said pressure container is formed from one or more materials selected from the group consisting of stainless steel or fiber reinforced polymers.

29. The hydrogen storage bed system of claim 1, wherein said pressure container is a multilayer structure.

30. The hydrogen storage bed system of claim 29, wherein said pressure container is a three layered structure.

31. The hydrogen storage bed system of claim 30, wherein said three layered structure comprises:

an inner layer formed form a lightweight material which is non-reactive with hydrogen and said storage alloy, and can withstand the operating temperature of the system;

a middle layer formed from a lightweight insulating; and

an outer layer formed from a fiber reinforced polymer composite which contains the operating pressure of the bed system.

32. The hydrogen storage bed system of claim 1, wherein said system further comprises thermocouples disposed throughout the interior of said hydrogen storage alloy to determine the state of charge of said system by observing temperature spikes in discharged areas of said alloy.

33. The hydrogen storage bed system of claim 1, wherein said system further comprises a hydrogen gas distribution system to enhance the speed of hydriding/dehydriding of said storage alloy.

34. The hydrogen storage bed system of claim 33, wherein said hydrogen gas distribution system includes a distribution manifold and one or more hydrogen permeable gas distribution tubes distributed throughout said hydrogen storage alloy.

35. The hydrogen storage bed system of claim 1, wherein said integrated thermal management system further comprises:

heat conducting projections extending and distributed within said pressure container in heat transfer contact with said hydrogen storage alloy; and

a heating/cooling sink positioned within said pressure container and connected in heat transfer relationship to said heat conducting projections and to said heat generation means and said cooling means;

whereby heat is transferred to said hydrogen storage alloy from said heat generation means and from said hydrogen storage alloy to said cooling means through said heat conducting projections and said heating/cooling sink.

36. The hydrogen storage bed system of claim 19, wherein said Mg based alloy has a composition of 95.6 wt.% Mg, 1.6 wt.% Ni, 0.8 wt.% Si and 2.0 wt% Mm.